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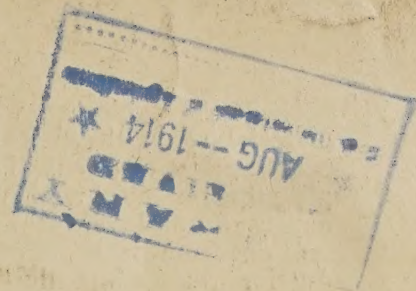
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United States Department of Agriculture,

BUREAU OF PLANT INDUSTRY,

Office of Foreign Seed and Plant Introduction.



HOW TO SEND LIVING PLANT MATERIAL TO AMERICA.

By DAVID FAIRCHILD,

Agricultural Explorer in Charge of the Office of Foreign Seed and Plant Introduction.

INTRODUCTION.

The difficulties of sending living plants are generally exaggerated, while the dangers, on the other hand, are almost universally underestimated. Properly selected cuttings or scions of most of the common woody plants, if properly packed and kept at a temperature between 50° and 60° F. (10° and 15° C.), can be shipped halfway around the world. A single cutting infested by a scale insect or a parasitic fungous disease may infect a whole country and lead to the destruction of a great plant industry.

It is with the object of explaining how this introduction of new plant material should be done in order to avoid the dangers of introducing diseases and to insure the arrival of the material in a vigorous growing condition that this circular has been prepared.

The easiest and at the same time the safest way to send plant material is in the form of seeds, whenever these will reproduce the same variety as the mother plant from which they came. In general, the cultivated tree fruits and shrubs are the result of grafting, and plants grown from their seeds do not produce the same quality of fruit as the parent. This fact can generally be easily determined, for those who are growing the plants, even though they belong to savage tribes, know how the plants are reproduced. If the plants are wild, it is always safest to send their seeds if they can be secured. If not, the attempt should be made to send cuttings on the chance that they may succeed.

SEEDS: THEIR PREPARATION FOR SHIPMENT.

Seeds should be fully *ripe* when collected. They should be *pure* seeds, i. e., *not mixed with other seeds*. It is, of course, sometimes impracticable to clean seeds in the field, and the correspondent will have to depend upon the seed-cleaning apparatus of the Department of Agriculture to remove all weed seeds when the shipments arrive. Seeds should be *dry*, but *not dried in bright sunlight*—rather by being spread out in the shade.

Seeds vary enormously in their vitality. Some seeds die in a few days if dried out, while wheat and other grains retain their vitality for 20 years or even longer—not, as sometimes reported, for centuries. In general, small-sized seeds with hard or dry shells, such as grass seeds and grains, melon seeds, and vegetable seeds, can be successfully shipped dry in sacks or envelopes. (Pl. I.) Large nuts, particularly chestnuts or acorns, and palm seeds or seeds of fruit trees—in fact, any large *tree seeds with oily kernels*—should be packed in *slightly moistened charcoal*, preferably charcoal which has been washed to remove the creosote (Pl. I). Sphagnum moss which is

barely moist may also be used for this purpose. For some very short-lived seeds, like mango and mangosteen seeds, a slightly moistened mixture of half charcoal and half chopped sphagnum moss has been very successful.

Seeds taken from fruits should be thoroughly washed and cleaned of fruit pulp and *dried in the shade* before packing in charcoal, as the chief danger in the shipping of such seeds is from molds which get started in the bits of decaying pulp attached to the seeds and grow into the living seeds themselves.

If all the packing material is first washed in 2 per cent formalin and then thoroughly washed in boiled water, the chances of molds injuring the seeds seem to be lessened.

CUTTINGS OR SCIONS: THEIR PREPARATION FOR SHIPMENT.

It is not always easy to find out except by experiment whether a small piece of a plant when put in sand or water will form roots and grow or whether it must be grafted on some other rooted plant. If it roots, it is called a cutting; if it has to be grafted by any of the many ways of graftage, it is called a scion. Cuttings and scions should be selected with great care. They should be branches of the plant which have made a vigorous, clean growth. (Pl. II.) The buds should be well formed. Every cutting should be inspected, to make sure that no scale insects or disease spots are on it, and only those sent that have clean, healthy bark. The diameter of the cutting to select varies greatly, depending upon the species, as illustrated in Plate II. Large cuttings carry better than small, slender ones. In general (there are many exceptions), a cutting or scion should be taken from that part of the branch which has finished its first season's growth and is not yet 2 years old. After the leaves fall is the best time to take cuttings of deciduous trees and shrubs—hardwood cuttings. Cuttings of softwooded plants, such as geraniums, are somewhat more difficult to send long distances, as they are likely to decay. They often arrive, however, in good condition. These cuttings can be taken at almost any time, but it is important that they have the proper texture or age. If upon being bent the shoot snaps off squarely, so as to hang together with only a bit of bark, it is in the proper condition for cuttings, but if it bends or simply crushes it is either too old or too young. Scions of the orange or plants with evergreen leaves can be taken at any time of year and the leaves cut off as shown in Plate II.

Many methods, some of them very complicated, of packing scions or cuttings have been experimented with, but the simple one described photographically in Plate III has yielded as good results as any yet tried, although our

agricultural explorers, who send in large quantities of material, often abandon the use of tin tubes and sew up their bundles of scions in strong cotton cloth, after wrapping them in moist sphagnum and oiled paper, thus saving expense in postage. In using the mailing tins which are sent out from the Office of Foreign Seed and Plant Introduction, the method illustrated progressively by figures 1 to 10 of Plate III is advised.

DIRECTIONS FOR USING MAILING TINS.

Take the tin out of its mailing sack, open it, and remove the dry sphagnum moss. Fill the cap with water up to the small hole in it and sprinkle this amount of water over the moss. *Mix the moss thoroughly with the hands until it is all of the same degree of dampness. Do not add more water or moss.* Spread this out carefully at one corner of the waxed paper which you will find in the tin, lay the cuttings or scions, from three to six, depending upon the size, on the moss, covering them lightly with it. Fold the corner of the paper down and then roll the cuttings and moss in the paper just tightly enough so that the roll will go in the tin, folding the side corners of the paper in under the roll, as shown in Plate III, figures 5, 6, and 7. Write the name of the plant, its variety name, the date, and the locality where collected on a slip of paper and put it in the roll. Put this roll into the tin, place the cap on, and put the tin in its sack.

Paste the necessary postage stamps on the tag which accompanies each tin. The tin when packed must not exceed 12 ounces, or 350 grams, in weight, and the rate of postage is about equivalent to 1 cent in foreign money per ounce (29 grams) or fraction thereof. Write the name and address of the sender on each tag, in order to identify the shipment when it arrives in Washington. Arrange, if possible, to keep the tins cool in transit on board steamer.

ROOTED PLANTS: PREPARATION FOR SHIPMENT.

While small rooted plants may be shipped short distances in mailing tins if their roots are wrapped in moss and their tops left uncovered, in general rooted plants which will stand an ocean voyage are too large to send by sample post and must be forwarded by parcel post, express, or freight.

To prepare these plants for shipment, they should be carefully dug without injuring the many fine, fibrous roots. A small ball of earth should be left around the roots if the plant is an evergreen one, but from the roots of trees which drop their leaves in autumn (deciduous trees) it is better to shake out the unnecessary soil and pack the roots carefully in moist sphagnum moss, tying this moss securely around them with twine. The tops should not be wrapped, except for frost protection when shipped in freezing weather. Several individual plants, each carefully prepared, can be packed in a well-ventilated box, the important point being to *fasten each plant securely in the box* so that it can not tumble around in it, no matter on which side the box is laid. (Pl. IV.)

By placing balled plants so that their roots are toward the ends and their tops together in the center of the box, the foliage of evergreen plants can be given more

air and thus be prevented from falling off. By alternating the tops and roots much space can be saved, and this can be safely done with plants which have no leaves on them.

The ventilation of a box of plants is important, and in general several 1-inch holes, bored in the region where the tops of the plants are located, afford sufficient ventilation if they are on all four sides of the box. *Every hole in a box of plants should be covered with a piece of wire screen to prevent rats and mice from getting into the box while it is on board ship.*

It is of the utmost importance that plant shipments be kept cool in transit, and wherever possible arrangements should be made with the purser of the steamer which carries them to have the box put in what is known as the cool room (not the cold-storage room), where a temperature between 35° and 50° F. is maintained. The optimum temperature is about 50° F.

WARDIAN-CASE SHIPMENT OF TROPICAL PLANTS.

In shipping tender tropical plants long distances it is generally necessary to send them in what is known as a Wardian case, a kind of portable greenhouse. (Pls. V and VI.) A strong wooden box is made, with an extra-strong bottom raised off the ground on short legs and having handles at each end. The sloping roof is composed of two glazed sashes, one of which is hinged at the ridge pole, so it can be raised like a box lid. The glass is protected by strong slats, and ventilation is provided by two small holes, one at each end of the box near the ridge pole. These holes are covered with wire netting. *Wardian cases must be carried on the deck of the steamer in order to give the plants light, but they should be placed under an awning and must be protected from salt spray and the salt water used in scrubbing down the deck, which are very injurious to foliage.* The plants must be watered about once a week in transit, a thorough soaking with fresh water being sufficient. If packed around with damp coconut fiber, the plants will require less frequent watering.

SHIPPING DIRECTIONS.

Sample-post shipments should be mailed direct to the Office of Foreign Seed and Plant Introduction, Department of Agriculture, Washington, D. C., United States of America.

The rate in all countries in the Postal Union is the equivalent of 1 cent (5 centimes) per 2 ounces (57 grams) or fraction thereof. The rate to and from Australia and Central American and South American countries is generally double this sum. Packages must not be sealed.

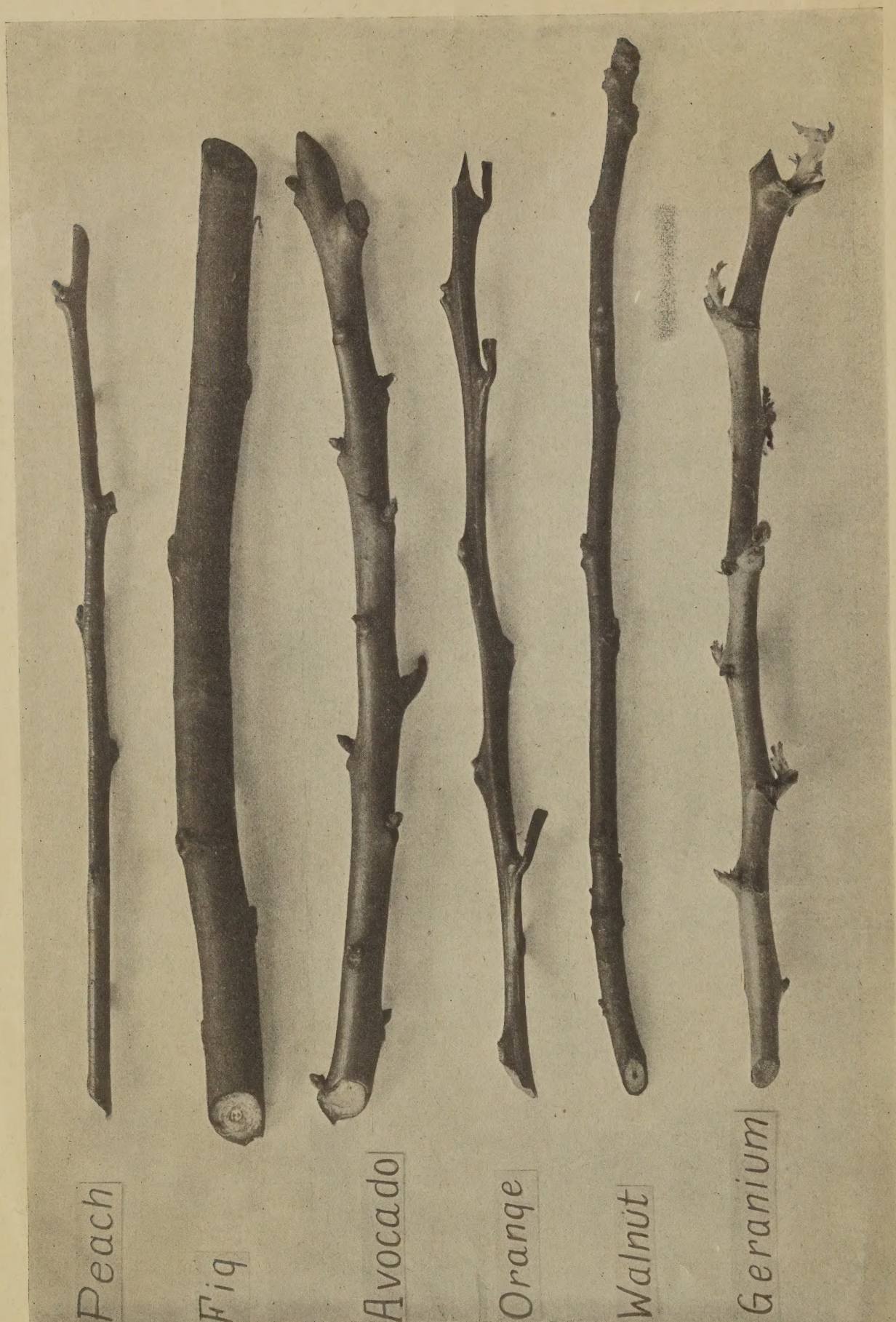
No writing except the name, the date, the locality, and the shipper's name is allowed in the package. It must not exceed 12 ounces (350 grams) in weight or the following dimensions: 30 by 20 by 10 centimeters (12 by 8 by 4 inches) except that when in the form of a roll it may measure not to exceed 30 by 14 centimeters (12 inches long by 6 inches in diameter).

Parcel post.—If too large for sample post, send, if possible, by parcel post, in care of the Government dispatch agent at New York, San Francisco, or Seattle. The

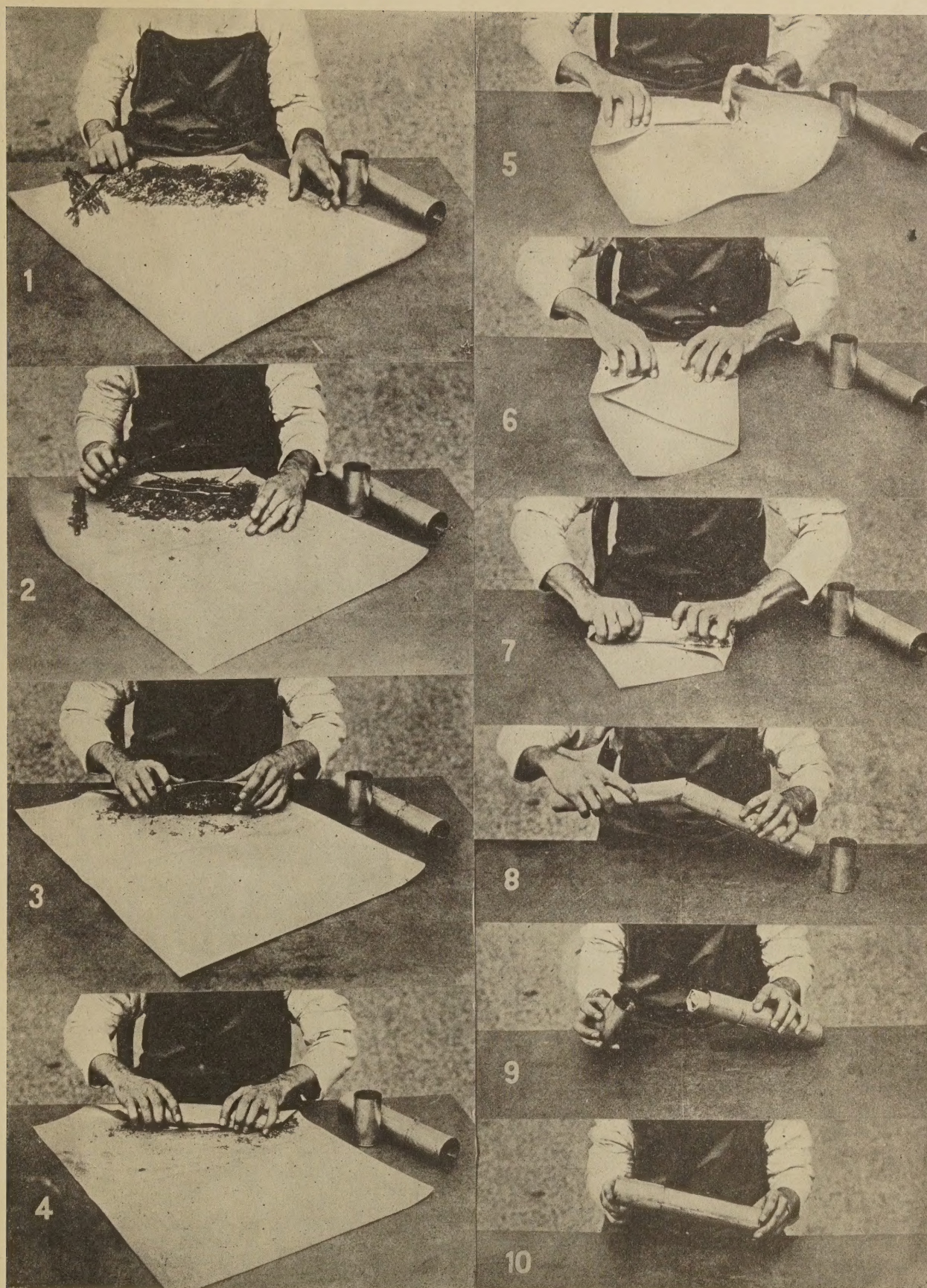


PACKAGES SHOWING METHODS OF PREPARING SEEDS FOR SHIPMENT BY SAMPLE AND PARCEL POST.

Short-lived seeds are packed in moistened charcoal or sphagnum moss, whereas grains and other long-lived seeds can be sent in seed packets, envelopes, or strong cloth sacks and these assembled in packages. (Examples of packages as received at Washington.)

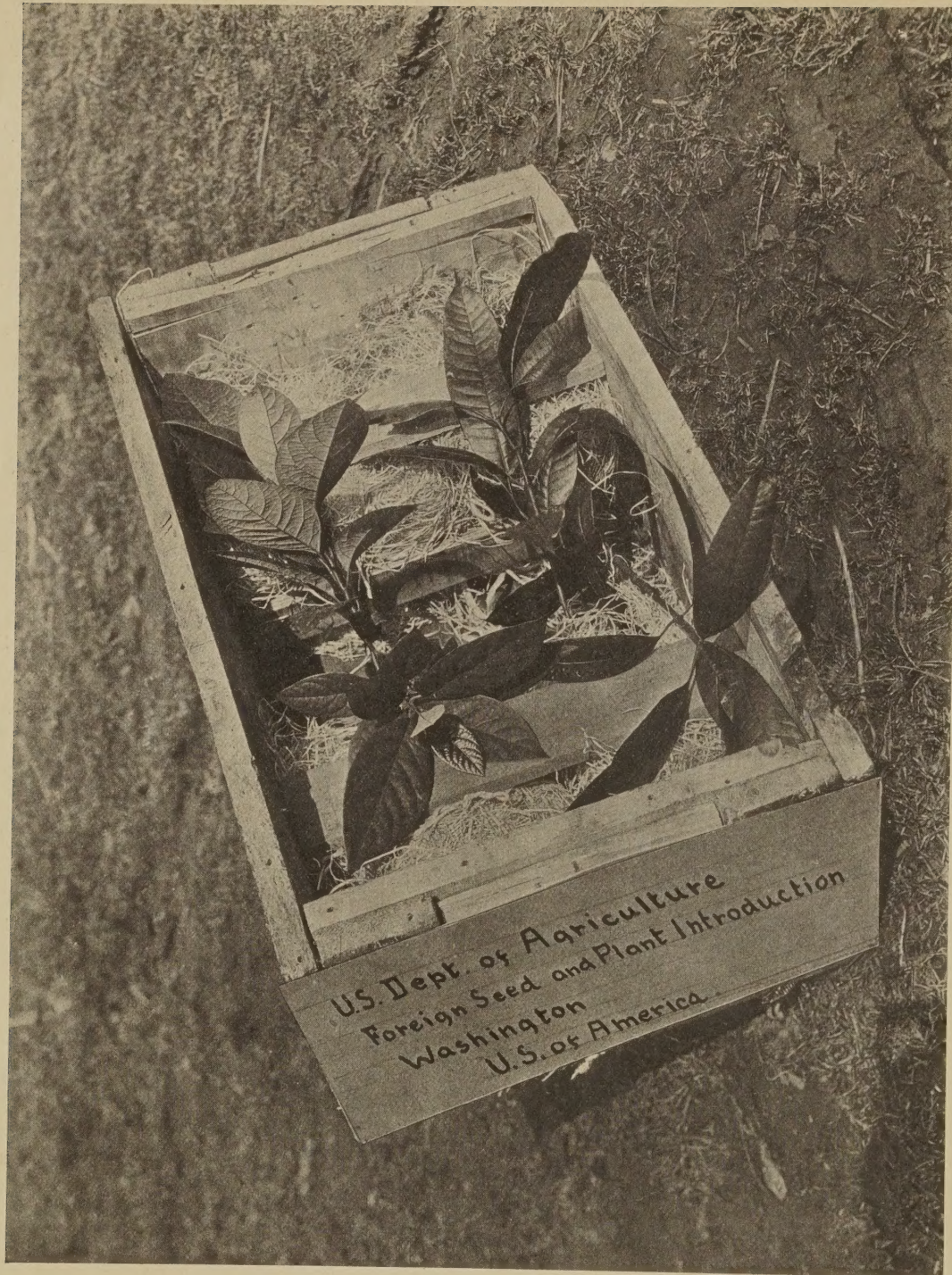


VARIOUS PLANT CUTTINGS OR SCIONS AS THEY SHOULD APPEAR WHEN CUT FOR SHIPMENT BY SAMPLE POST.
To carry well, the cuttings should not be smaller than those in the illustration, but rather larger.



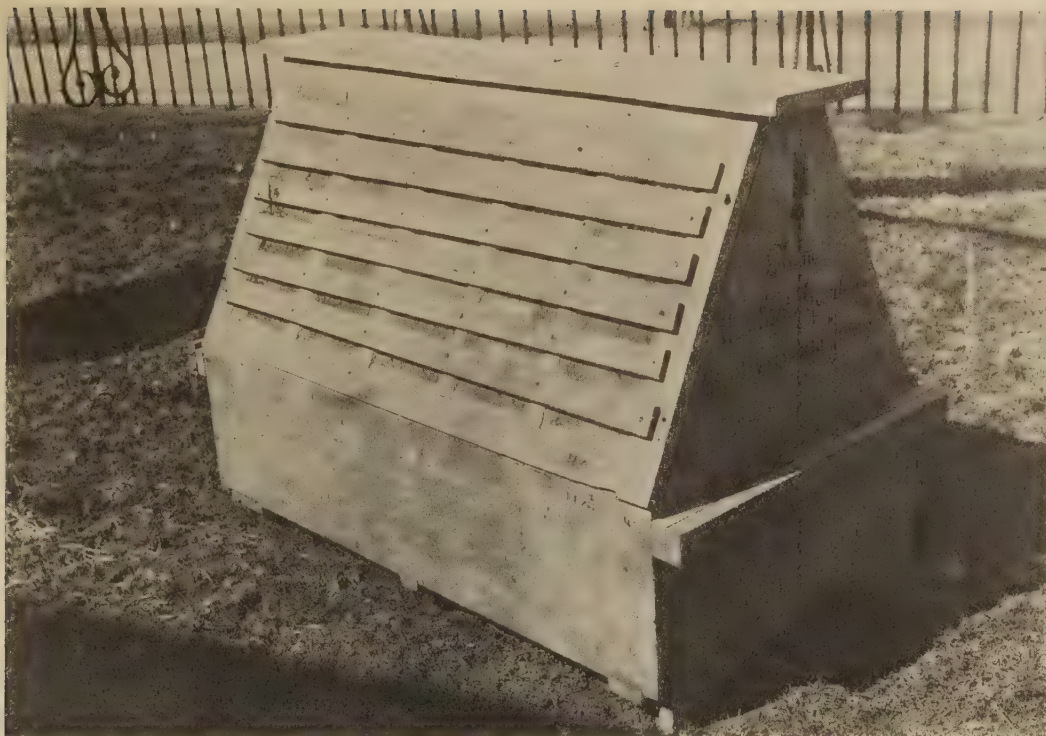
HOW TO PACK PLANT CUTTINGS FOR THE SAMPLE POST.

Mailing tins, moss, and oiled paper are furnished to foreign correspondents and cooperators. Figures 1 to 10 show how the cuttings should be laid in the damp sphagnum, rolled up in the oiled paper, and inserted in the mailing tin. Wrapped in this same way and sewed up in cloth, cuttings may be sent without the tin.



LIVING PLANTS PACKED FOR SHIPMENT BY FREIGHT OR EXPRESS.

Each plant has its roots covered with sphagnum moss bound with twine. By means of cross pieces each plant is securely fastened in the box. The ventilation holes are all screened. Excelsior, burlap, or strong paper may be wrapped around the balls of moss to advantage. The roots of the plants should be packed at the ends of the box, their tops in the middle.



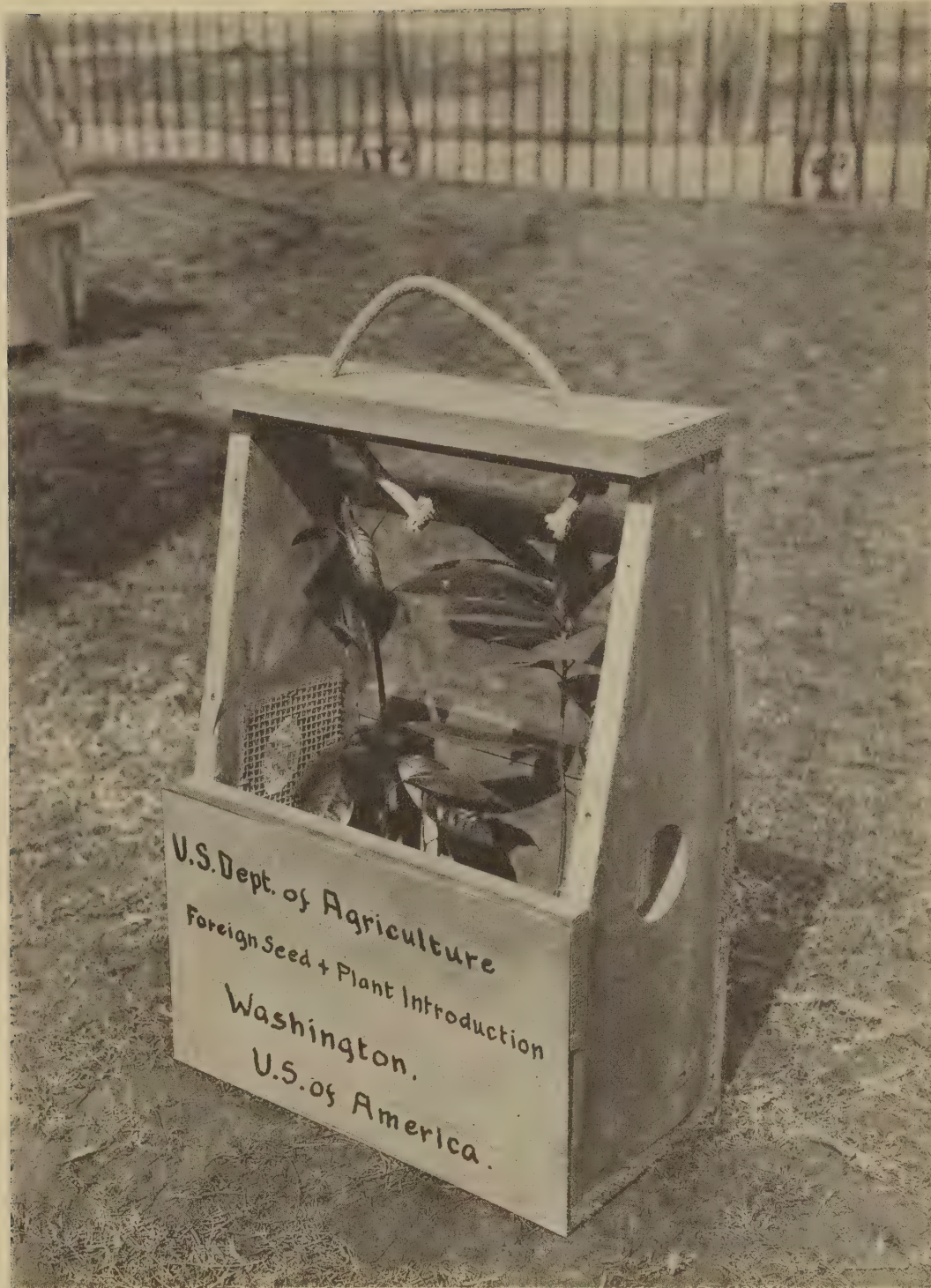
WARDIAN CASE OF LIVING TROPICAL PLANTS PACKED FOR A JOURNEY OF SEVERAL WEEKS' DURATION, WITH ROOF OR COVER IN PLACE, READY FOR SHIPMENT.

A 1-inch hole for ventilating purposes is bored through each end and screened with wire to keep out mice. Both covers, composing the roof, are of glass, protected from breaking by slats. The top board should not project at the ends as shown, as it is liable to be torn off.



WARDIAN CASE OF LIVING TROPICAL PLANTS PACKED FOR A JOURNEY OF SEVERAL WEEKS' DURATION, BROKEN OPEN TO SHOW CONSTRUCTION.

Each plant must be securely fastened in the case by means of cross slats. This case should be carried on deck in a light but not sunny situation, sheltered from salt spray as much as possible. The plants require watering once a week. One plant is shown out of the case in order to illustrate the method of wrapping the ball with excelsior.



HAND WARDIAN CASE OF LIVING TROPICAL PLANTS PACKED FOR A JOURNEY OF SEVERAL WEEKS' DURATION.

Each plant must be securely fastened in the case by means of cross slats. Ventilators, in this case large ones, must be screened, and the glass roof must be protected from breaking by slats or heavy wire. This case should be carried on deck in a light but not sunny situation, sheltered from salt spray and from salt water used in scrubbing down the deck. The plants require watering once a week.

agent should be notified. If from a country with which the United States does not have a parcel-post agreement, send to the United States Government dispatch agent, 4 Trafalgar Square, London, England. He will forward.

A parcel for the parcel post must not exceed 11 pounds in weight in any foreign country. The greatest allowable length varies from 2 feet to $3\frac{1}{2}$ feet in different countries, while the greatest girth is 4 feet and the greatest length and girth combined is 6 feet.

Parcels sent by parcel post must not be sealed or contain any writing except plant names, locality, date of collection, and name of collector.

Freight or express.—Do not make a freight or express shipment without first writing to the Office of Foreign Seed and Plant Introduction to inquire whether we wish to bear the expense or not. Below is given a list of official dispatch agents through whom shipments may be made. In addition to this, the American consuls in all foreign countries are authorized to act as our agents. The official dispatch agents should always be notified beforehand of shipments made through them, and copies of shipping documents should be sent to them as well as to Washington.

Labels on shipments should bear the words "Foreign Seed and Plant Introduction, United States Department of Agriculture," to enable the dispatch agents to identify them.

London, England. C. J. Petherick, Deputy U. S. Dispatch Agent, 4 Trafalgar Square, London, England.

New York. I. P. Roosa, U. S. Dispatch Agent, 2 Rector Street, New York, U. S. A.

San Francisco. Dr. H. H. Hicks, 411 Post Office Building, San Francisco, Cal., U. S. A.

Seattle. Dr. Jens Madsen, 602 Central Building, Seattle, Wash., U. S. A.

QUARANTINE REGULATIONS.

All postmasters in the Postal Union have been advised from the headquarters in Berne that the circular of May 5, 1913, No. 2251/18, will not apply to plants or plant products addressed to the United States Department of Agriculture, Washington, D. C., and they should receive for shipment to America all experimental plant shipments which are addressed to the United States Department of Agriculture, Washington, D. C. In this, they are complying with the American quarantine act, which provides for quarantine inspection in Washington of all official plant shipments.

DESCRIPTIONS AND PHOTOGRAPHS.

Every plant introduction which is made by any individual through the Government is recorded in printed form, and the description which is given by the sender is published as a historical record. It is of the greatest importance that these records should give as full details as possible regarding each new plant immigrant. All friends of plant introduction, all over the world, are urged, therefore, whenever they send in plant material to write a full description of what they are sending and accompany it with photographs whenever possible. This will insure due credit being given by the public to the introducer in later years should the introduction prove to be a valuable addition to the useful plants of this country.

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